

Coleman, R.; Mazur, B.

The eigencurve. (English) [Zbl 0932.11030](#)

Scholl, A. J. (ed.) et al., Galois representations in arithmetic algebraic geometry. Proceedings of the symposium, Durham, UK, July 9–18, 1996. Cambridge: Cambridge University Press. Lond. Math. Soc. Lect. Note Ser. 254, 1-113 (1998).

Let p be an odd prime number and $N \geq 1$ be an integer relatively prime to p . Let $\Lambda_N := \mathbb{Z}_p[[\mathbb{Z}/N\mathbb{Z}]^\times \times \mathbb{Z}_p^\times]$. H. Hida has constructed a finite flat Λ_N -algebra which is universal for slope O (overconvergent) eigenforms of tame level N , and such that the associated rigid analytic space $C_{p,N}^0$ parametrizes p -adic analytic families of slope O eigenforms [Ann. Sci. Ec. Norm. Supér. (4) 19, 231-273 (1986; [Zbl 0607.10022](#)); Invent. Math. 85, 545-613 (1986; [Zbl 0612.10021](#))]. R. Coleman [[Invent. 127, 417-479 \(1997; Zbl 0918.11026\)](#)] established a satisfactory analogue of Hida's result for finite slope classical eigenforms.

It is the aim of this article to construct a rigid analytic curve ("the eigencurve") C_p which parametrizes all finite slope overconvergent p -adic eigenforms of tame level 1 (Theorem E). It turns out that Hida's rigid space $C_{p,1}$ occurs as a component part of C_p . The eigencurve C_p has a natural embedding into the rigid analytic space $X_p \times \mathbb{A}^1$, where X_p is the rigid analytic space attached to the universal deformation ring of certain Galois (pseudo-) representations. If $c \in C_p$ corresponds to the overconvergent eigenform f_c , then the first coordinate of c is the Galois (pseudo-) representation attached to f_c and the second one is the converse of the U_p -eigenvalue of f_c . The authors give two different constructions (by means of Fredholm determinants, and the Banach module theory respectively) of rigid analytic curves which parametrize the collection of all overconvergent eigenforms of tame level 1 and of finite slope. Consequences of the relationship between them are summarized in section 1.5 (Theorems A, B, C, G).

For the entire collection see [[Zbl 0905.00052](#)].

Reviewer: [A.Dabrowski \(Szczecin\)](#)

MSC:

- [11F33](#) Congruences for modular and p -adic modular forms
- [11F80](#) Galois representations
- [11G20](#) Curves over finite and local fields
- [46H25](#) Normed modules and Banach modules, topological modules (if not placed in 13-XX or 16-XX)

Cited in **19** Reviews
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Keywords:

Galois representation; Hecke algebra; rigid analytic curve; eigencurve; overconvergent p -adic eigenforms; rigid analytic space; universal deformation ring; Fredholm determinants; Banach module